The ABAG Local Government Energy Partnership presents:

Example Benefits of Energy Smart HVAC Replacement

This sheet accompanies the LGEP Energy Smart HVAC Replacement Program handout. The table below shows the lifecycle benefit of replacing a 15 ton rooftop electric/gas package unit of varying ages for a typical California office building. An example and list of assumptions are included on the reverse side of this handout.

Example of Lifecycle Benefits for Early Retirement of a 15 Ton Air-Cooled Package Unit with Degraded Performance and Without an Economizer

Existing Equipment Vintage	Equipment Age (year)	Old Unit Original Energy Efficiency Ratio (EER)	New Unit EER (CEE Tier 2)	Annual Energy Savings (If EER of Old Unit Degraded 10%)	Annual Energy Savings (If Add Economizer)	Energy Savings Due to Early Replacement in Present Value (PV)	Additional Ownership Cost Due to Early Retirement (PV)	Net Lifecycle Benefit (PV)
1978	27	6.8	10.8	$1,338	$1,601	$1,539	$954	$585
1979	26	6.8	10.8	$1,338	$1,601	$1,539	$954	$585
1980	25	7.5	10.8	$1,050	$1,313	$1,262	$954	$308
1981	24	7.5	10.8	$1,050	$1,313	$1,262	$954	$308
1982	23	7.5	10.8	$1,050	$1,313	$1,262	$954	$308
1983	22	7.5	10.8	$1,050	$1,313	$1,262	$954	$308
1984	21	8.2	10.8	$811	$1,073	$1,032	$954	$78
1985	20	8.2	10.8	$811	$1,073	$1,032	$954	$78
1986	19	8.2	10.8	$811	$1,073	$1,032	$954	$78
1987	18	8.2	10.8	$811	$1,073	$2,025	$1,871	$153
1988	17	8.2	10.8	$811	$1,073	$2,979	$2,754	$225
1989	16	8.2	10.8	$811	$1,073	$3,897	$3,602	$295
1990	15	8.2	10.8	$811	$1,073	$4,779	$4,417	$362
1991	14	8.2	10.8	$811	$1,073	$5,627	$5,202	$426
1992	13	8.5	10.8	$721	$983	$5,901	$5,956	-$55
1993	12	8.5	10.8	$721	$983	$6,619	$6,681	-$62
1994	11	8.5	10.8	$721	$983	$7,310	$7,378	-$68
1995	10	8.5	10.8	$721	$983	$7,974	$8,048	-$74
1996	9	8.5	10.8	$721	$983	$8,612	$8,693	-$80
1997	8	8.5	10.8	$721	$983	$9,226	$9,312	-$86
1998	7	8.5	10.8	$721	$983	$9,817	$9,908	-$91
1999	6	8.5	10.8	$721	$983	$10,384	$10,481	-$97
2000	5	8.5	10.8	$721	$983	$10,930	$11,032	-$102
2001	4	9.7	10.8	$415	$677	$7,894	$11,562	-$3,668
2002	3	9.7	10.8	$415	$677	$8,242	$12,071	-$3,830
2003	2	9.7	10.8	$415	$677	$8,576	$12,561	-$3,985
2004	1	9.7	10.8	$415	$677	$8,898	$13,032	-$4,135
2005	0	9.7	10.8	$415	$677	$9,207	$13,485	-$4,278

An example using the table on the front of this handout:

If a package unit was originally installed in 1990, the unit can be assumed to have an EER of around 8.2. The unit can be replaced by a new unit with an EER of 10.8, saving $811 per year. Savings increase to $1,073 per year if an economizer is added when the unit is replaced. Present value of the energy savings between now and 2010 (the time the unit would have been replaced otherwise) is $4,779. Additional cost of replacing a new unit before 2010 is $4,417, a new benefit of $362.

This example assumes that the existing unit is in poor condition and does not have an economizer, a device that allows more outside air to be used to cool the building when outside air is cooler than the air in the building. Early retirement is cost-effective in this example for units over 14 years old. If the building HVAC units are operating 24 hours per day, then it could be cost-effective to replace even newer units.

Note on Assumptions: *Assumes existing units met minimum Title 24 efficiency standard in effect when installed. Early replacement cost is the present value of the annualized ownership cost from the date of early retirement to the end of equipment life, assuming an equipment life of 20 years, equipment cost of $13,485 for a new unit (from CEC DEER Database 2001), and a discount rate of 4%. Assumes no salvage value. Annual savings assumes an average electricity cost of $0.15/kWh, 700 full load cooling hours, and 15% savings from economizer. Lifecycle savings is the present value of the savings from the date of early retirement to the end of equipment life. Table estimates cooling savings only, as heating efficiencies for gas fired package units have not improved significantly.*

This handout accompanies the Energy Smart HVAC Replacement handout from the ABAG Local Government Energy Partnership as a part of our efforts to help cities and government agencies save energy and money.
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